Araştırma Makalesi / Research Article

Bank Interest Rate Margins and Uncertainty: A Forward-Looking Approach

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Abstract

The behavior of banks in setting interest rate margins has been in the interest of a variety of groups including management, shareholders, and policymakers. On this basis, the literature has employed a wide range of micro and macroeconomic factors in analyzing the interest rate margin. This study focuses more on uncertainty and investigates the role of uncertainty on bank interest margin setting in Turkey. The analysis shows that higher uncertainty is associated with higher interest rate margins both in the short term and long term.

Keywords: *banking, interest rate margin, uncertainty, cointegration*

Jel Codes: *C22, E43, G21*

Faiz Oranı Marjının Belirlenmesinde Belirsizliğin Banka Davranışı Üzerindeki Etkisi

Öz

Bankaların faiz oranı marjlarını belirleme davranışı, yönetim, hissedarlar ve politika yapıcılar dahil olmak üzere çeşitli grupların ilgi odağında olmuştur. Bu noktada, literatür, faiz oranı marjını analiz ederken çok çeşitli

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mikro ve makroekonomik faktörleri kullanmıştır. Bu çalışma daha çok belirsizliğe odaklanmakta ve belirsizliğin Türkiye'de banka faiz marjı belirleme üzerindeki rolünü incelemektedir. Analiz, daha yüksek belirsizliğin hem kısa vadede hem de uzun vadede daha yüksek faiz oranı marjları ile ilişkili olduğunu göstermektedir.

Anahtar Kelimeler: *bankacılık, faiz marjı, belirsizlik, eşbütünleşme*

1. Introduction

The banking sector has an important role in contributing to economic growth through the intermediation of funds. Therefore, a more efficient banking sector brings a well-functioning credit market, lower intermediation costs, in turn, lower cost of finance for agents. Although the banking sector has undergone significant structural changes and evolving banking environment delivers a more diversified income base, interest rate margin is still an important source of income for banks. Interest rate margin reflects the impact of many factors ranging from bank-specific factors, legal framework, and sector-specific identities to macroeconomic indicators.

The literature has extensively investigated the determinants of interest rate margin empirically and has diverse conclusions on the bank behavior in setting interest rate margin. In this study, we aim to investigate the impact of uncertainty on the interest rate margin of the Turkish banking sector on which discussion has remained limited. This study differs from the previous studies in several ways. First, the interest rate margin is extracted from the difference between the loan and deposit interest rates contrary to previous studies using interest incomes and expenses from bank financial statements. To capture the forward-looking pricing behavior of banks, we employ the difference between the loan and deposit interest rates. Secondly, we utilize an ex-ante measure of uncertainty and provide a view of how banks consider forward-looking uncertainty in setting interest rates.

The results show that higher uncertainty is associated with higher interest rate margins both in the short-term and long-term after controlling for short-term funding costs. The rest of this paper is structured as follows. Section 2 provides an overview of the literature and Section 3 summarizes the data. Section 4 presents the methodology and the empirical findings. Section 5 concludes the paper.

2. Literature Review

The discussions on interest rate setting behavior of banks go back to (Klein, 1971) and (O'Hara, 1983) and they both use microeconomic models. (Klein, 1971) concludes no relation between the asset and passive sides of the bank balance sheets while (O'Hara, 1983) argues an interrelation between asset, liability and equity choice of banks. (Ho & Saunders, 1981) employ interest rate margin in modeling the bank behavior to maximize the utility of shareholder wealth, and their theoretical model suggests that the interest rate margin is determined by risk aversion of bank management, market structure, the average size of bank transactions and interest rate variability. (Angbazo, 1997) extends (Ho & Saunders, 1981) and suggests that interest rate margin is affected by both interest rate risk premium and credit risk premium. (Saunders & Schumacher, 2000) use also the model introduced by (Ho & Saunders, 1981) and conclude that the regulatory changes affect interest rate margin in OECD countries.

(Demirguc-Kunt & Huizinga, 1999) investigate the determinants of interest rate margin ranging from institutional features to regulations for a broader sample consisting of nearly 80 countries. The operating costs, size, and international ownership as micro factors; inflation and real interest rate among the macroeconomic factors affect the interest rate margin. Again for OECD countries, (Hawtrey & Liang, 2008) conclude interest rate margin is inversely affected by size but in the same direction by managerial efficiency, market power, operating cost, risk aversion, volatility of interest rate, credit risk, opportunity cost, and implicit interest payments. For European countries, (Guevara & Maudos, 2002) show that market concentration contributes to higher interest rate margins but this effect is counterbalanced by the reduction of interest rate risk, credit risk, and operating costs. (Claeys & Vander Vennet, 2008) show that high-interest rate margins in Central and Eastern European countries are associated with low efficiency and competition.

Studies on emerging markets also disclose similar factors in determining interest rate margins. (Catão, 1998) confirms the impact of high administrative costs, inefficient payment system, credit risk and exchange rate risk on the interest rate margins for Argentina. (Afanasieff, Lhacer, & Nakane, 2002) argue interest rate margin moves in the same direction as the interest rate and inflation in Brazil. From the ownership perspective, (Martinez Peria & Mody, 2004) claim higher foreign bank participation pulls down interest rate margin via lower administrative costs in Latin American countries. Likewise, (Gelos, 2006) conclude that interest rate margin is higher due to less efficient banks,

less supportive legal environment, higher levels of interest rates, and larger reserve requirements for the Latin American banking sector. The analysis of the Mexican banking system by (Guevara & Maudos, 2002) points out that average operating costs and market power have explanatory power on higher interest rate margins.

Although there are many studies on interest rate margin in the literature, the number of studies on the Turkish banking sector has remained limited. Erol (2007) investigates the determinants of net interest margins in the Turkish banking sector and the results show that bank interest rate margins are affected by diversification, risk aversion, interest rate and exchange rate risks, and credit risk but the impact differentiate among the banks at different size and origin. The results also point out that inflation and growth don't have a statistically significant effect on bank interest rate margin. Ozdincer and Ozyildirim (2010) employ credit-deposit interest rates differential to proxy interest rate margin and conclude that maturity mismatch, interest rate risk and the share of deposits in liabilities affect the interest rate margin but the level of interest rate doesn't have an impact on interest rate margin.

In this framework, there are a bunch of variables to investigate interest rate margins but the variability in the literature is not limited to the variables explaining interest rate margins. The definition of interest rate margins also differs in the means of measurement and there are diverse approaches to measuring interest rate margins. One straightforward approach is extracting interest rate margins from the difference between the loan and deposit interest rates as in Valverde, Paso, and Fernández (2007) and Martinez et al. (2004). Although it is practical to utilize this measure, using the interest rate differential between loan and deposit rates is debatable and carries some drawbacks of which the most pronounced one is whether loan and deposit rates measure the effective rates. For example, reserve requirements affect the net interest margin but it doesn't contain information about the changing efficiency or price setting behavior of banks so it distorts the information content of interest rate margin.

Another approach is to take the difference between interest income and expenses as a ratio to total assets from financial statements as in (Angbazo, 1997), (Guevara & Maudos, 2002), (Demirguc-Kunt & Huizinga, 1999), (Hawtrey & Liang, 2008), and (Claeys & Vander Vennet, 2008). This methodology brings the advantage of not dealing with problems like changing costs associated with factors outside the control of banks such as changing regulations. The rising popularity of adjustment in banking costs along with

macroprudential policies points out the advantage of proxying interest rate margin from financial statement data. Yet, using data from financial statements is not free from deficiencies. The first and most prominent one is that interest incomes may not reflect the current economic situation, current period interest rates, and forward-looking bank pricing behavior. For example, interest rate margin from financial statement data may include seasonal trends and lagged loan proceedings reflecting past NPLs so it may be noisy.

3. Data

We use monthly sector-level credit and deposit interest rates, implied currency volatility as a proxy of uncertainty, and the TRLIBOR rate to control for the changing financing costs of banks due to factors such as regulations. The data covers the period between 2004 and 2018. Interest rate margin is the difference between credit and deposit interest rates at the sector level to bring a more macro perspective and to capture the forward-looking price-setting behavior of the banking sector compared to measures derived from the income statement (e.g. net interest income). Although maturities on deposits are very short in Turkey, we use deposit rates up to 1 year to make it more comparable with credit interest rates owning longer maturities in the means of isolating other risk factors like maturity, liquidity, etc. On the credit side, we utilize consumer credit interest rates as housing or car loans have longer maturity compared to consumer credits. Furthermore, housing and car loans are more prone to adjustments in costs due to macroprudential policies.

As we are interested in the forward-looking price-setting behavior of banks, we select the uncertainty indicator considering its information content on future expectations. Currency is a good indicator of current economic developments and forward-looking expectations, and the data could be easily accessible, therefore, uncertainty is proxied by the one-year implied volatility of the USDTRY exchange rate (implied currency volatility). Since using interest rate differential between credit and deposit contains some drawbacks like not accounting for the impact of other factors affecting funding costs such as changing reserve requirements in the framework of macroprudential policies, we add TRLIBOR at one-month maturity (short term rate) as a control variable to capture these effects. The data on interest rates, the one-year implied volatility of the USDTRY exchange rate, and TRLIBOR are collected from CBRT, Bloomberg, and TBB respectively. Table 1 presents the descriptive statistics and shows that the variables are not normally distributed.

Table 1 – Descriptive Statistics

Interest rate margin is calculated by the difference between consumer loan and deposit interest rate at one-year maturity. Implied currency volatility is derived from one year ATM implied volatility of USDTRY options. TRLIBOR is the reference interbank interest rate at one-month maturity.			
	Interest Rate Margin (pp)	Implied Currency Volatility	TRLIBOR (%)
Mean	6.97	15.20	13.24
Median	6.80	14.85	11.85
Maximum	15.02	30.35	27.30
Std. Dev.	2.05	3.32	5.41
Skewness	0.82	0.79	0.62
Kurtosis	4.16	5.27	2.44
Observations	180	180	180

4. Methodology and Results

Before going into an empirical model setup, we test the stationary of the data (Table 1) not to encounter the problems of persistence of shocks, spurious regressions, and invalid asymptotic analysis. We test the stationary of the data by the tests of ADF (augmented Dickey Fuller), DF-GLS and ERS-PO (Elliot-Rothenberg-Stock Point Optimal), PP (Phillips and Perron), KPSS (Kwiatkowski–Phillips–Schmidt–Shin) and NP-Z (Ng and Perron). Table 2 summarizes the test statistics and significance levels. ADF, DF-GLS, PP, ERS-PO, and NP tests reject the unit root process for the interest rate margin and uncertainty but do not reject the unit root for the short-term rate. KPSS test results are mixed in the sense that it doesn't confirm other tests and doesn't reject stationary of the interest rate margin but rejects stationarity of uncertainty and short-term interest rate. Therefore, the results are inconclusive about the stationarity of uncertainty. The results hold after the trend variable is added.

Table 2 – Unit Root Test Results

ADF, DF-GLS, ERS-PO, PP, KPSS, and NP-Z are abbreviations for augmented Dickey-Fuller, GLS Dickey-Fuller, Elliot-Rothenberg-Stock Point Optimal, Phillips and Perron, Kwiatkowski–Phillips–Schmidt–Shin, and Ng and Perron tests. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

		ADF	DF-GLS	PP	KPSS	ERS-PO	NP-Z
Interest Rate Margin (%)	Constant	-3.02**	-3.01***	-3.13**	0.16	1.92**	-2.85***
Implied Currency Volatility		-3.82***	-2.32**	-3.79***	0.35*	2.92**	-2.25**
TRLIBOR		-1.83	-0.69	-2.01	0.64**	33.53	-0.67
ΔTRLIBOR		-12.18***	-2.29**	-12.20***	0.57**	0.80***	-2.03**
Interest Rate Margin (%)	Constant and Trend	-3.03	-3.05**	-3.12	0.15**	5.84*	-2.89*
Implied Currency Volatility		-3.73**	-3.21**	-3.71**	0.17**	5.82*	-3.02**
TRLIBOR		-0.72	-0.14	-0.84	0.34***	47.69	-0.10
ΔTRLIBOR		-12.57***	-10.66***	-12.56***	0.06	1.34***	-6.50***

Hence, all variables are not I(0) in our dataset and the existence of I(0) and I(1) variables doubts the cointegrating relationship between variables. However, it is not suitable to test cointegration by (Engle & Granger, 1987) or (Johansen & Juselius, 1990) because all variables are not I(1). Rather, we implement the bounds test of (Pesaran, Shin, & Smith, 2001) that could be used for the cointegrating relationship for both I(0) and I(1) variables. The bounds test has the advantages of not putting forward I(1) as a precondition for all variables and providing an efficient cointegrating relationship even in small samples. One prerequisite of bounds testing is that variables should not be I(2). Table 2 shows that only the short-term rate has a unit root according to all tests so we repeat the unit root test for the difference of the short-term rate series and unit root tests reject I(2) process for the short-term rate.

To perform the bounds test, we first form an ARDL model (Eq. (1)) that is also instrumental in understanding both short-term and long-term dynamics between interest rate margin (IRM) and forcing variables of implied currency volatility (ICV) and short-term rate (TRLIBOR). Based on the results of the ARDL model in (1), the results of the bounds test reject the null hypothesis of no cointegrating relationship[2].

$$\Delta IRM_t = \alpha + \sum_1^n \gamma_1 \Delta IRM_{t-i} + \sum_0^n \gamma_2 \Delta ICV_{t-i} + \sum_0^n \gamma_3 \Delta TRLIBOR_{t-i} + \delta_1 IRM_{t-1} + \delta_2 ICV_{t-1} + \delta_3 TRLIBOR_{t-1} + \varepsilon_t \quad (1)$$

[2] Relevant F-stat is 6.19 and the critical values from Pesaran, Shin and Smith (2001) are 3.17–4.14, 3.79–4.85, 4.41–5.52, 5.15–6.36 for 10%, 5%, 2.5%, and 1% significance level, respectively.

The bounds test rejects no cointegration between variables and implies that there is a long-term relationship between the variables (Table 3 – Panel A). That said, ARDL model results show there is a long-term relationship between uncertainty (implied currency volatility) and interest rate margin. The positive coefficient indicates that higher uncertainty is associated with a higher interest rate margin. On the other hand, the short-term interest rate has no long-term relationship with the interest rate margin. However, the short-term interest rate has a relationship with the interest rate margin in the short term (Table 3 – Panel B). The short-term relationship between interest rate margin and uncertainty is positive and consistent with long-term findings. The negative and statistically significant error correction term confirms the results of the bounds test and suggests interest rate margin restore to equilibrium following a shock in the long-run equilibrium.

Table 3 – ARDL Model

Long run coefficients and short-run error correction representation (dependent variable is interest rate margin) of ARDL(1,2,2) model, ECM is the abbreviation of error correction model.

	Coef.	Std. Err.	t	P>t
Panel A. Estimated long-run coefficients				
Implied Currency Volatility	0.60	0.24	2.47	0.01
TRLIBOR	0.02	0.13	0.12	0.90
Panel B. Error correction representation				
ΔImplied Currency Volatility	0.13	0.04	3.19	0.00
ΔImplied Currency Volatility $_{-1}$	0.05	0.05	1.15	0.25
ΔTRLIBOR	-0.12	0.07	-1.77	0.08
ΔTRLIBOR$_{-1}$	0.27	0.06	4.75	0.00
Constant	-0.31	0.10	-2.99	0.00
ECM$_{-1}$	-0.15	0.03	-4.34	0.00

5. Conclusion

The banking sector has an important role in contributing to economic growth and the interest rate margin-setting behavior of banks has attracted the interest of different groups in the economy. Although the literature includes many studies investigating the determinants of interest rate margins, we concentrate on the role of forward-looking uncertainty on bank interest rate setting behavior. We proxy the interest rate margin by the difference between credit and deposit interest rates charged by Turkish banks, and uncertainty by the implied currency volatility. Empirically, we use an ARDL model to

analyze the relationship between interest rate margin and uncertainty after controlling for short-term changes captured by TRLIBOR.

The results show that higher uncertainty and interest rate margin are positively associated both in the short-term and long-term after controlling the short-term funding costs reflecting the impact of other factors like macroprudential policies. Previous results point out different factors related to interest rate margins but our results are very intuitive and important in the means of underlying the importance of controlling uncertainty to bring down the banks' interest rate margins and thereby credit interest rates. In this context, policymaking with clear guidance and supervision to diminish uncertainty and its effects is important to make banks in adjusting lower premiums between credit and deposit interest rates. In this manner, lower interest rate margins bring down credit interest rates charged by banks.

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